The relevance of university degrees for developing work-ready Information Technology graduates

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There is an increasing expectation that Universities have a responsibility to produce work ready graduates. Past and current literature focuses on academic, professional associations and employer perspectives of graduates. Understanding and studying the lived experiences of graduates at work has been given little or no attention. In this paper we present the findings of a research study that was undertaken to describe and analyse the non-technical work experiences of recent Australian Information Technology (IT) graduates. We conducted a grounded theory study of such graduates with less than three years experience in the IT industry. They were interviewed to determine their perceptions of the relevance of their University studies to the non-technical skills they needed in the workplace. Additional online surveys were also conducted with IT graduates. The research focussed on the non-technical requirements at work, development of non-technical skills required at work, most useful aspects of University courses and major challenges faced by IT graduates at work. Overall, the findings suggest that while graduates recognise the contribution their University IT degree had made to their technical skills development they greatly value the essential work-ready skills, which they had developed largely through sources external to their University studies. These results have implications for IT academics, graduates and employer groups and general implications for the higher education sector.

Keywords: university degrees, work-ready graduates, non-technical skills

Introduction

Universities around the world are under extreme pressure to produce graduates who can make a smooth transition to work so they become expert practitioners in their chosen professional fields (Nettleton et al., 2008 and Candy, 2000). Candy (2000) portrays Universities as being both adaptable and enduring institutions that are undergoing a multitude of changes in response to imperatives of neo liberal pragmatism, focussing on learner-worker performance issues. Catts (2004) sees the role of Universities in contemporary times as twofold: to help students develop lifelong learning skills to sustain in their chosen profession and to help students to attain disciplinary or professional knowledge. According to Clanchy and Ballard (1995) it is unrealistic for Universities to guarantee that their students will graduate in possession of all the desirable generic skills and attributes spelt out in their University's graduate skills attributes as such a guarantee may leave the Universities vulnerable to litigation in the most extreme cases. However they state that Universities should guarantee that their students would have opportunities to learn and develop generic skills and abilities during their University study.

The relationship between higher education and working life is an area of research that has attracted increasing interest in recent years (Brennan, Kogan & Teichler, 1996, Nettleton et al., 2008). According to Dahlgren et al. (2006), research has hitherto described the transition from higher education to working life in rather general categories and there is sparse knowledge about how graduates construe themselves as professionals or how they experience transition. While much of the research was interested in the match between the output of the higher education and the societal demands for trained person power, few studies were concerned with the experienced impact of the education or specific work task requirements. Understanding the development of skills that assist graduates to transition smoothly to professional work is an important task for both profession and educators.

Research that pays attention to graduate perceptions of the practical relevance of their courses or the development of knowledge and skills applicable to their work experiences provides insights into understanding the transition of graduates from University to the workplace, and is of interest to the whole higher education community (Richardson and Kabanoff, 2003; Dahlgren et al., 2006). In particular, Begel and Simon (2008) call for increased research on computer science professional novices. Their findings from a study conducted at Microsoft suggest that many of the problems faced by professional software novices are directly attributed to poor communication skills and social naïveté. Johnston (2003) also highlighted that there was little information in the research literature on graduate employment from a graduate's perspective.

Scenario: Information Technology profession

In the information technology profession, minimal research literature exists on understanding graduate perspectives of their work experiences and how they perceive their courses of study in relation to their work experiences, especially during the early employment years. Anecdotal evidence and some recent reports in the literature suggest that graduates from all disciplines are lacking in job skills and ill prepared for real work situations ((AC Nielsen Research Services (2000), Maiden and Kerr (2006), Hagan (2004), Business Council of Australia Report (2006) and Snoke (2004)). This has often ignited heated debate within the IT profession about the adequacy of preparation of IT graduates for real work situations although the IT industry is multi-dimensional and simple definitions of the needs of employers are not possible.

According to Wong et al. (2006), non-technical skills and personal attributes such as team work, communication skills, integrity, reliability and self-motivation are considered more important than purely technical skills in IT graduates. The study also found that 78% of jobs advertised for IT graduates specified non-technical skills rather than other skills. The following are the major factors that influenced our decision to focus on non-technical skills:
a) many graduates with good technical skills do not get jobs, mainly because of their poor non-technical skills. AC Nielsen Research Services (2000) suggested that a strong disciplinary knowledge base alone is insufficient for a new graduate to get a job;
b) while quite a few studies exist on technical skills there are not many on non-technical skills; and
c) our research looks at the graduates' viewpoints rather than the more usual view of employers and educators.

Focus of our study

Hounsell (2005) uses an approach whereby the study examines the experience of learning first from perspectives adopted by other groups such as lecturers, researchers, psychologists, etc before examining the student's perspective with a view towards exploring the meaning of learning as it is understood by different groups. The student's perspective is then examined with a view to developing a new conceptualization of learning. Hounsell's work highlights that students were given a back seat observer role while teachers centred the teaching-learning processes around their own perceptions, one in which they rather than their students engaged. This argument also applies to IT education.

Our study takes a similar approach to Hounsell and aims to understand the relevance of the IT courses to their graduates' work experience. That experience is examined first from the perspectives adopted by other groups such as employers, Universities and professional organizations in an attempt to explore the meaning of 'learning' 'work experiences' and 'graduate skills'. We then examine graduates' perspectives on these issues with a view to understanding if a theory of relationship exists between their workplace experiences and university studies.

While the knowledge and perspectives of academics and employers play a substantial role in shaping the teaching-learning process for the IT education that the students receive, student and mainly graduate perspectives have remained part of the background rather than the foreground of the discussion and debate. So the primary focus of our study is to explore the perceptions of recent IT graduates with a view to gaining some understanding of the nature of the relationship between their experiences at their workplaces and their IT education acquired before employment.

Study description and methodology

All participants were required to have an Australian Bachelor's degree in IT or a related discipline, to have graduated within the last three years and studied at University as a full-time local or international student. The participants were employed and working in a paid IT professional position for 0.5 - 3 years. Graduates could have completed work experience as a part of their University course but should not have had any other previous paid IT work experience.

In a grounded theory study, the key to grounded theory is to generate in-depth data that can illuminate the patterns, concepts, categories, properties and dimensions of a given phenomenon (Glaser and Strauss 1967, Strauss and Corbin 1998). The sample size is usually achieved through a process called theoretical saturation, when no new relevant data seems to emerge regarding a category. There were two main reasons for choosing a grounded theory approach. First, the topic needs exploration. Second, there is a need to present a detailed view of the topic. Our goal is not to make sweeping generalisations but to present contextual findings grounded in data, staying as close as possible to the construction of the world as participants originally experienced it (Creswell 2003). Figure 1 presents the research methodological map for our study (Creswell 2003).

In total, twenty four graduates, mostly from NSW participated in our study. Eleven were interviewed and the other thirteen responded to the online survey. After analysing the eleven hours of in-depth interviewing and the thirteen lengthy qualitative surveys, we believe we are

close to the theoretical saturation point for our study. Guest, Bunce and Johnson (2006) experimented with data saturation and variability on interviews and reached saturation with twelve interviews. They found that although saturation occurred within the first twelve interviews, the basic elements for metathemes were present as early as six interviews. Our experiences and findings with our data sets align well with the argument that twelve interviews are sufficient to reach data saturation, particularly if the research is to understand common perceptions and experiences among a group of relatively homogeneous individuals (Guest, Bunce and Johnson, 2006).

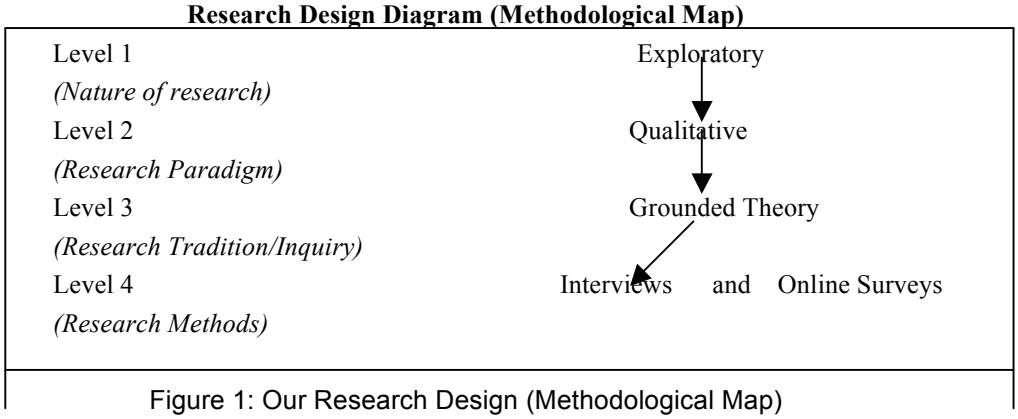

Figure 1: Our Research Design (Methodological Map)

It is also important to note that we have not used a pure grounded theory approach to the depth indicated by Strauss and Corbin (1998). This is evident from our decision to conduct online surveying in addition to the interviews. And we believe by not being too pure in our grounded theory approach, we are better able to achieve this study's objectives. Suddaby (2006) discusses why a pure grounded theory approach could neither be efficient nor comprehensible to the majority of researchers and promotes a pragmatic application of grounded theory:

> …grounded theory techniques are inherently "messy" and require researchers to develop a tacit knowledge of or feel for when purist admonitions may not be appropriate to their research and may be ignored.

In the first phase, eleven interviews were completed. The interview questions explored four main aspects: non-technical skill requirements at work, development of non-technical skills required at work, most useful aspects of University courses and challenges faced by IT graduates when starting work.

Interview transcripts were analysed for major issues and themes raised by graduates. The findings formed the basis of the questions we then asked in the online surveys. These surveys helped us establish if the identified themes apply to a broader range of graduates and helped to identify any additional issues that were not captured during the interviews.

Data analysis and findings

Both the interview transcripts and survey responses were examined to identify key issues. We searched for themes, defined as a common meaning or an idea that runs through most of the data or minority ideas that capture a particular emotion or factual idea (Creswell 2003). From this analysis, dominant themes were identified and described. The interview transcripts were examined carefully word by word and broken down into concepts and categories and

compared for similarities and differences. As the interviews progressed, data was sorted into concepts and categories. Theoretical sensitivity meant we stepped back from the data and questioned the assumptions or biases that might be present. The coding scheme consists of four high level categories. They are:

1. Non-technical skill requirements at work
2. Development of non-technical skills required at work
3. Most useful aspects of University courses
4. Immediate challenges faced by IT graduates at work

In our data analysis, we identified several dominant themes for each of the above categories. These dominant themes are our interpretation of the key issues described by the respondents during interviews and online survey. Due to space restrictions we present our analysis and categorisation of dominant themes in a tabular form in Table 1. More detailed discussion and analysis of the findings are available in (Nagarajan and Edwards, 2008).

Table 1: Categorisation of major themes from interviews and online surveys

Non-technical skills required (Dominant themes)	**Sources of Non-technical skills (Dominant themes)**
Communication Skills Team work skills Conflict resolution skills Managing expectations Risk Management Time Management Adherence to standards Abstraction versus generalization Eye for detail/design Ability to learn from mistakes Analytical and logical reasoning Attitude to gain new skills/ Research Knowledge of organizational procedures Customer service	University IT degree Other University courses (sociology, psychology, business etc..) Other formal courses (TAFE, short courses) Previous careers Previous work experience (IT related) Previous work experience (non-IT related) Family relationships Friends Social networks/clubs Extra curricular activities at school, college, University Natural talent and interest Mentoring
Challenges at work (Dominant themes)	**Most useful aspects of University studies (Dominant themes)**
Time Management Cultural awareness Managing client expectations Gender domination Working with senior managers Limiting reaction Ability to sell ideas Professional development Learning curve with new systems/ Reliance on tools Coordination of people and resources Risk management and mitigation Limited mentoring Communication skills	Project management Subjects that involved presentations Project work (simulated projects, assignments, teamwork) Work placement/industry experience as a part of the course Subjects that involved formal written reports Business related subjects (e-business, marketing etc..)

Discussion of related research in other professional areas

In a Canadian study, Evers and Rush (1996) collected views from University students and graduates working with corporate employers. The study discusses the need for all employees to possess managerial skills irrespective of whether or not they are in managerial positions and that this notion is increasingly becoming essential not just desirable. They state that in the battle between content and skills, content usually takes precedence over skills in University courses. We found that the dominant themes that emerged from our study were similar to the four bases of competence and sub categories for skill development proposed by Evers and Rush (1996) but we noted that there were two sub categories namely visioning and leadership/influence (italicised in Table 2) that did not emerge in our study. Table 2 presents the themes from our study and how we see it relate to the four bases of competence for skill development.

Table 2: Evers and Rush model and related themes from our study

Evers and Rush model of four bases of competence for skill development during transition from University to Work	**Related themes arising from our study of non-technical skills for IT graduates**
Mobilizing innovation and change • Ability to conceptualise • Creativity/Innovation/Change • Risk-taking • *Visioning*	• Risk Management • Eye for details/design • Ability to learn from mistakes • Abstraction/Generalisation • Project (change) management • Adherence to standards • Attitude to gain new skills/ Research
Managing People and tasks • Coordinating • Decision-making • *Leadership/Influence* • Managing conflict • Planning and organizing	• Coordination of people and resources • Time management • Team work • Conflict resolution/negotiation • Managing expectations • Ability to cope with gender domination • Cultural awareness • Adherence to standards • Knowledge of organizational procedures
Communicating • Interpersonal • Listening • Oral communication • Written communication	• Communication skills (oral, written) • Customer service • Limiting reaction • Ability to sell ideas • Ability to work in cross cultural environment
Managing self • Learning • Personal strengths • Personal organization/Time Management • Problem solving	• Time management • Analytical and logical reasoning • Professional development

Dahlgren et al. (2008) developed a model to represent the theory of student engagement and situated identity formation in the context of professional knowledge and perceptions for work based on findings from two international projects known as the *journeymen project* based in Europe and the *professional entity project* based in Australia.

According to their model, areas of professional identity include: 1) Extrinsic Technical (professional work is constituted as a group of technical components that can be used when work demands it) 2) Extrinsic meaning – professional work is about developing meaning inherent in discipline objects and 3) Intrinsic meaning (professional work is related to a person's own personal and professional being). These aspects of knowledge for work are described as Ritual (exchange value of knowledge - where connection to a specific context of application is lacking) and Rational (utility value of knowledge - preparing for a specific field of knowledge or professional field of work). Rational substantive skills are content specific and contextually situated; rational generic skills are transferable between different contexts.

IT graduates in our study positioned themselves closer to extrinsic meaning and extrinsic technical identities. Further, a majority of the IT graduates positioned themselves in the rational category and their responses on valuing the experience of internships during studies highlight this finding. Figure 2 shows our interpretation of Dahlgren et al.'s model. The diagonal arrow in the model shows identity and engagement are strongest at the far ends of the two dimensions (bottom-right) and weakest at the most limiting positions (top-left). Based on this interpretation of the model, we found the IT graduates to be somewhere between top-left and centre of the model.

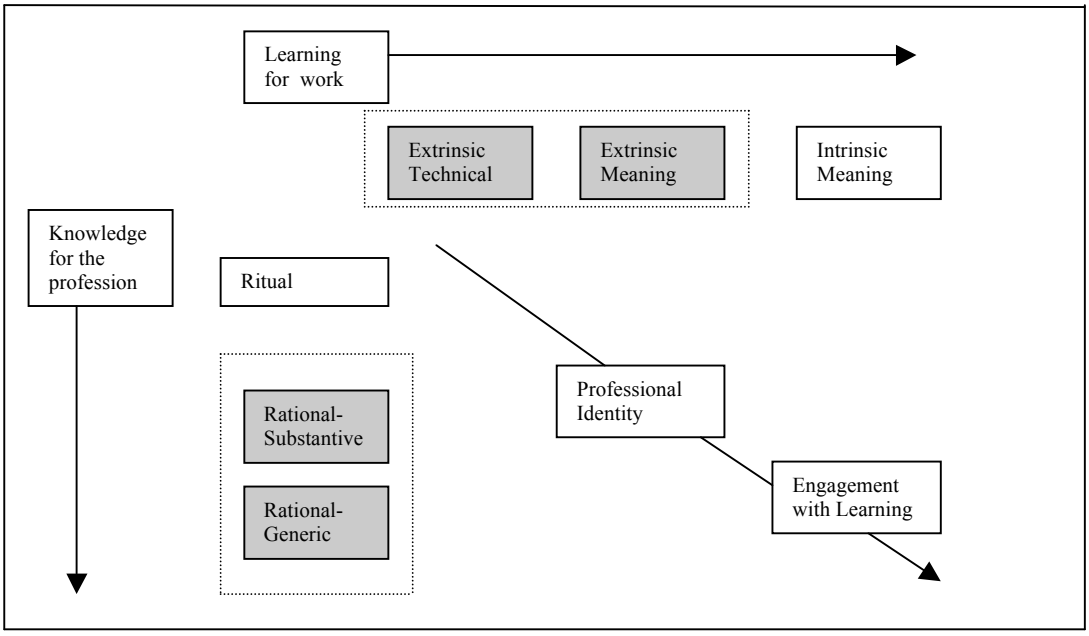

Figure 2: Our interpretation of Dahlgren et al.'s model for understanding professional learning

Implications of the findings for University IT courses and the IT industry

Immediate challenges faced by IT graduates at work

Findings from our studies show that IT graduates confront many challenges at work when they first enter the workforce. Some of those issues listed in Table 1 are discussed here.

- Gender domination: The IT industry is male dominated. Graduates needed to be aware of their roles and the gender imbalances surrounding their work environment.
- Time and priority management: Management of their workload and priorities was challenging, particularly when they were working on several different projects or tasks at the same time.

- Cultural awareness: Being able to understand and communicate with international clients in Asia-Pacific or European countries was very challenging as there was a striking difference in their culture and workplace activities. Graduates had to take extreme care in composing all communication including e-mail messages to deliver their message in a simple, clear, professional and timely manner.
- Managing client expectations: Juggling between different client expectations was another difficult task. It was important for graduates to keep in touch with their clients on a regular basis and provide them with required status reports so they were able to develop or create solutions that met clients' expectations and needs.
- Coordination of people and resources: Determining the resources required for the work to be done, scheduling meetings, coordinating attendance at meetings, venue selection and discussion item development were quite challenging as they needed to be aware of several factors such as personalities, experience, expertise, budget etc.
- Ability to 'sell' ideas: Graduates needed a tactical approach to present their innovative ideas to the superiors at the right place at the right time. They were unsure and cautious about the reactions their ideas might draw from their immediate managers and peers.
- Limited mentoring and lack of professional development opportunities also made it difficult for graduates when they entered the workforce.

The findings from our study raise many questions for IT educators and employer groups. Some of the questions are: Do the IT courses aim at fostering lifelong learning skills in their IT graduates by providing opportunities for them to learn how to relate unknown, unexpected professional situations? Do the courses employ effective strategies to equip students with a variety of skills (generic, job specific and personal) to promote situational learning? If they already do, why isn't this working? What factors contribute to the mismatch between employer expectations of graduates and graduate expectations at work? There is a need for further exploration of these issues.

Most useful aspects of University IT courses

Some common answers emerged when we asked IT graduates about the most useful aspects of their University studies. They indicated that subjects such as project management taught them key needed non-technical skills. These included using planning tools, coordination of a variety of tasks and organising their thinking. Thesis subjects were valued for the research skills and documentation skills they helped develop. Subjects where assignments or projects involved teamwork were regarded as useful for developing teamwork and report writing skills. Almost all those interviewed thought that the best part of their studies at the University and the most useful for when they commenced full time work was when they undertook a work placement in the IT industry. According to the graduates, the work placement helped develop their social engagement skills by providing exposure to clients and professionals. Presenting reports and findings in their own words helped them feel that they were accountable and responsible for their actions and ideas and helped them put their education and theory into practice. It also contributed to the development of self-confidence in real situations where their maturity and responsibility were tested away from the safety of a learning environment.

Issues arising from this research

Analysis of IT graduate perspectives informs us that work placement works well as a model of learning to teach students principles of lifelong learning, situated learning and transformative learning. Use of simulated work environments seems to be highly valued when industry placement and traineeships are not possible for practical reasons. Inclusion of

topics from subject areas outside IT such as business, management, sociology or psychology also seems to assist graduates with opportunities to understand and work with other professionals.

We understand that University courses differ in length, coverage of content or focus within similar subjects and this complicates the task of developing programs of study all of which would provide the same set of generic attributes for an IT graduate. Nor should they! It is important that graduates, Universities and employers have realistic expectations of each other and their roles and responsibilities to ensure they allow for both formal learning as well as lifelong learning in order to shape a confident and efficient workforce. If Universities can prepare students entering the workforce with the realisation that: "The whole of life is learning. Therefore, education can never end" and that learning is a never-ending process of input, change and confrontations, their graduates will be able to engage in divergent thinking and accept feedback about their performance non-defensively (Vaughan, 2000).

Conclusion and future work

By looking through the lens of recent IT graduates in the industry, we believe our research study is a promising step towards assisting IT employers and IT academics to identify and understand those factors and issues that matters most for IT graduates.

Based on our current findings our future work has the potential to address questions such as: 1) What are the typical non-technical requirements of IT professional practice? 2) From a graduate's viewpoint, what are the elements of his/her University study program that contributed towards the graduate's fulfilling the non-technical requirements of his/her IT professional practice? and 3) From a graduate's viewpoint, how well did his/her University studies prepare him/her to meet the non-technical needs of his/her professional practice?

We also encourage IT education researchers to draw upon similar studies conducted in other professions. Similarly, international researchers need to collaborate and share their findings to reflect on broader issues that may address the non-technical requirements of IT professional practice around the globe.

References

AC Nielsen Research Services. (2000). *Employer Satisfaction with Graduate Skills*. Canberra: Australian Government Publishing Service.

Abrandt Dahlgren, M., Reid, A., Dahlgren, L. O. and Petocz, P. (2008) Learning for the professions: Lessons from linking international research projects. *Higher Education,* 56(2), 129-148

Begel, A. and Simon, B. (2008). Novice Software Developers, All Over Again, *Proceedings. of International Computing Education Research (ICER) 2008 Conference*, pp.3-14 (CDROM). Sydney, Australia.

Brennan, J., Kogan, M. and Teicher, U. (1996) (eds) *Higher Education and Work*, London: Jessica Kingsley Publishers.

Business Council of Australia. (2006). *New Concepts in Innovation – The keys to a growing Australia*. Melbourne:Howard Partners.

Candy, P.C. (2000). Learning and earning: Graduate skills for an uncertain future. In Appleton, K., Macpherson, C. & Orr, D. (eds.), *Selected papers from the inaugural international Lifelong Learning Conference, Yeppoon, Central Queensland, Australia* (pp. 7-19). Rockhampton, Australia: Central Queensland University.

Catts, R. (2004). *Lifelong learning and higher education: Reflections and prospects*. A keynote paper presented at the 3rd International Lifelong learning conference, Yeppoon, Central Queensland, Australia

Clanchy, J., & Ballard, B. (1995). Generic skills in the context of higher education. *Higher Education Research and Development*, *14* (2), 155-156.

Creswell, J. W. (2003): *Research Design: Qualitative, quantitative and mixed methods approaches*. Thousand Oaks, CA: Sage Publications.
Dahlgren, M. A., Hult, H., Dahlgren, L.O., af Segerstad, H. H., and Johansson, K. (2006): From senior student to novice worker: Learning trajectories in political science, psychology and mechanical engineering. *Studies in Higher Education,* 31(5), 569-586.
Evers, F. T. and Rush, J. C., (1996). The Bases of Competence: Skill Development During the Transition from University to Work*, Management Learning*, 27(3), 275-300, London: Sage Publications http://mlq.sagepub.com/cgi/content/abstract/27/3/275 retrieved on 08 January 2009.
Glaser, B. G., & Strauss, A. (1967). T*he discovery of grounded theory: strategies for qualitative research.* Chicago, Ill: Aldine Pub. Co.
Guest, G., Bunce, A. and Johnson, L. (2006) How many interviews are enough? An experiment with data saturation and variability. *Field Methods,* 18(1), 59-82http://fmx.sagepub.com/cgi/content/abstract/18/1/59 retrieved on 12 November 2008
Hagan, D. (2004). Employer Satisfaction with ICT Graduates. *Proceedings of the. Sixth Australasian Computing Education Conference ACE 2004*, 119-123, Dunedin, New Zealand: CRPIT, Australian Computer Society.
Hounsell, D. (2005). Understanding Teaching and Teaching for Understanding. In Marton, F., Hounsell, D. & Entwistle, N., (eds.) *The Experience of Learning:Implications for teaching and studying in higher education*. 3rd (Internet) edition. (pp.238-257). Edinburgh: University of Edinburgh, Centre for Teaching, Learning and Assessment.
Johnston, B. (2003): The shape of research in the field of higher education and graduate employment: some issues. *Studies in Higher Education,* 28 (4), 414-426.
Maiden, S. and Kerr, J. (2006). *Graduates 'lacking job skills'*, The Australian, 13 March 2006, p.1
Nettleton, S. Litchfield, A. & Taylor, T. (2008). Engaging professional societies in developing workready graduates*. Proceedings of Higher Education Research and Development Society of Australasia,* Rotorua, New Zealand,.http://www.herdsa.org.au/wp-content/uploads/conference/2008/media/Nettleton.pdf. retrieved 15 January 2009
Nagarajan, S.V. and Edwards, J. (2008). Towards understanding non-technical work experiences of recent Australian Information Technology graduates, *Proceedings of the Tenth Australasian Computing Education Conference ACE 2008*, Wollongong, Australia, 78, pp.103-112, CRPIT, Australian Computer Society.
Richardson, A. and Kabanoff, B. (2003): Graduates' perceptions of University study and its contribution towards the development of workplace competence, Proceedimgs of *AARE/NZARE 2003 Conference*, 1-14 (CDROM).
Snoke, R.L. (2004). Generic Attributes of Australian Information Systems Graduates: An empirical study. Ph.D. thesis. Queensland University of Technology.
Strauss, A. and Corbin, J. (1998): *Basics of qualitative research*. Thousands Oaks, CA., Sage Publications
Suddaby, R. (2006). From the editors: What Grounded theory is not. *Academy of Management*, 49(4), 633-642 http://www.idi.ntnu.no/grupper/su/publ/ese/suddaby-groundedtheory-ednote06.pdf retrieved 10 January 2008Vaughan, G. (2000). But it's not real training! Non-formal learning in the workplace, Training and Development in Australia, *Australian Institute of Training and Development*, 27(4), 7-11.
Wong, S., von Hellens, L. and Orr, J. (2000). Non-technical skills and personal attributes: The Soft Skills Matter Most. http://www-sqi-cit.gu.edu.au/wic2000/docs/wongetal.pdf retrieved 08 September 2006